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Voiced obstruents in L2 French: the case of Swiss German learners

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ABSTRACT

The phonemic inventory of French coherently exploits the contrast between voiced and unvoiced obstruents. This opposition is distinctive in almost all phonotactic contexts, with two exceptions: i) /z/ does not occur word-initially; ii) the feature [±voice] may be assimilated in accordance with a following obstruent. Quite a different system is found in Swiss German dialects, where pairs of obstruents sharing the same place and manner of articulation are not differentiated through the presence/absence of laryngeal activity, but rather in terms of longer or shorter duration; such an opposition is maintained even word-finally, though some kind of postlexical fortition does occur if two obstruents follow each other.

Therefore, one may predict that Swiss German learners will find major difficulties in realizing French voiced obstruents before other obstruents, whereas they might be more prone to achieve voicing in intervocalic contexts. All in all, these hypotheses are confirmed by the acoustic analysis of a corpus of read speech: the overall degree of voicing in the whole data only amounts to 46%; intervocalically, 68% of the obstruents were voiced, whereas in the prepausal position the subjects only obtained a degree of voicing of 6%.

Keywords: Obstruents, voicing, French, Swiss German.

1. INTRODUCTION

Previous research on French as a second language has pointed at 'Voice Onset Time' (VOT) as a major source of pronunciation difficulties. In particular, the examination of Dutch and English learners has focused on the positive VOT in unvoiced stops, i.e. on the degree of aspiration of these sounds (Bongaerts 1999, Birdsong 2007). Quite differently, the present study takes into account another setting: for native speakers of Swiss German, it is rather the pronunciation of voiced obstruents that appears to contribute to their 'foreign accent' in French.

This contribution reports on an empirical study that investigates how Swiss German learners cope with the voicing contrast in L2 French. In section 2, a sketch of contrastive analysis describes the obstruents of French and Swiss German, illustrating the relevant subsets of the respective phoneme inventories as well as the phonotactic constraints and the allophonic rules that govern their distribution in the speech chain. Section 3 documents the procedures of data collection and data analysis, whereas sections 4 and 5 provide the presentation and a discussion of the main results of the study.

2. THE FEATURES [±VOICE] AND [±TENSE]: CONTRASTING FRENCH AND SWISS GERMAN

2.1. Voiced obstruents in French

As regards the subsystem of obstruents, the phoneme inventory of French is rather simple and coherent. As appears in Table 1, based on the illustration of the International Phonetic Alphabet provided by Fougeron and Smith (1999: 79), there are only twelve obstruent phonemes, i.e. three pairs of stops – at the labial, coronal and dorsal places of articulation – as well as three pairs of fricatives, which are labiodental, dental and postalveolar. In the core lexicon, French lacks affricates. For our purpose, it is important to note that, phonetically, "French voiced stops are typically voiced throughout" (Fougeron and Smith 1999: 80); the same – one could add – holds for fricatives as well.

Table 1: Obstruent phonemes in French

	Bilabial		Labiodental		Dental		Palato-alveolar		Velar	
Plosive	p	b			t	d			k	G
Fricative			f	v	s	z	ʃ	ʒ		

The functional load of the voicing contrast is rather high, given that – in principle – it proves to be fully distinctive in word-initial, medial and also in word-final position, as one may observe in minimal pairs like /ʃu/ "cabbage" ~ /ʒu/ "to play (3rd pers. sg.)", /buʃe/ "butcher" ~ /buʒe/ "to move", /buʃ/ "mouth" ~ /buʒ/ "to move (3rd pers. sg.)". Thus, in the lexical phonology of French there is no such thing as the final obstruent devoicing known from several Germanic languages. However, a phonotactic constraint bans /z/ from the word-initial position and, moreover, an assimilation process may neutralize the feature [±voice] according to the specification of a following obstruent (cf. Léon 2007: 100). This phenomenon happens both within words (e.g. [ɔpsɛʀve] "to observe", [afgɑ̃] "Afghan") and across word boundaries (e.g., /ʒə kʀwa/ [ʒ̊kʁ̥wa] "I believe", /dɑ̃ sə baʀ/ [dɑ̃ s̬ baʀ] "in this bar"); the latter examples show that such postlexical devoicing or voicing is likely to occur after schwa deletion. From experimental studies on this topic we know that these allophonic rules are – to some extent – variable, rather than categorical (Rigault 1970; Snoeren and Segui 2003; Darcy and Kügler 2007; D'Apolito and Gili Fivela 2009).

2.2. The 'fortis' vs. 'lenis' contrast in Swiss German

Contrarily to French, Swiss German dialects completely lack voiced obstruents, instead showing binary opposition between so-called 'fortis' and 'lenis' consonants; it appears that the phonetic correlate of this distinction basically rests on the amount of closure duration (Willi 1996; Nocchi and Schmid 2006). Phonologically, the 'fortis' vs. 'lenis' contrast can be expressed by means of the feature [±tense] (Jakobson and Halle 1964: 100), but an alternative account has been proposed for the Thurgovian dialect, opposing singleton to geminate consonants (Kraehenmann 2003). In the following, I will refer to the Zurich dialect as described by Fleischer and Schmid (2006), adhering to the traditional distinction between 'fortis' and 'lenis' obstruents, the latter being transcribed with the IPA diacritic for voicelessness.

As emerges from Table 2, the feature [±tense] is regularly exploited for plosive and fricative phonemes, whereas there is only a single series of affricates. However, with respect to the feature [±tense], plosives differ from fricatives with respect to their phonotactic distribution: fricatives occur word-initially only as 'lenes', whereas tenseness is phonemically exploited in both word-internal and word-final contexts. For plosives, however, the contrast is relevant in word-initial, word-internal and word-final position. There is thus no equivalent to the final devoicing process observed in Standard German; both 'fortis' and 'lenis' obstruents can occur word-finally.

Table 2: Obstruent phonemes in Swiss German

	Bilabial		Labiodental		Alveolar		Palato-alveolar		Velar		Glottal
Plosive	p	b̥			t	d̥			k	g̊	
Fricative			f	v̥	s	z̥	ʃ	ʒ̊	x	ɣ̊	h
Affricate			pf		ts		ʧ		kx		

Nevertheless, the fortis-lenis contrast is neutralized in another context, e.g. when a lenis plosive stands before a fortis plosive: in this case, fortition of the lenis plosive occurs, e.g., /d̥ə z̥æb̥ tɒːg̊/ → [d̥ə z̥æp tɒːg̊] "that day". Also, if a lenis plosive stands before another lenis plosive, the result is again a fortis cluster, e.g. /heb̥ d̥i/ → [hep ti] "hold tight!" (Fleischer and Schmid 2006: 248). Thus, unlike in French, postlexical neutralization in Swiss German only yields the unmarked (fortis) realization.

On the basis of this short sketch of contrastive analysis, one may hypothesize that a Swiss German learner of French will tend to pronounce L2 voiced obstruents as (voiceless) 'lenes'; devoicing is supposed to be particularly frequent in a consonantal context.

3. DATA AND METHODS

In order to test the hypotheses formulated above, a corpus of read speech has been collected at the Phonetics Laboratory of the University of Zurich. The corpus consists of twenty sentences containing the six voiced obstruents /b d g v z ʒ/ in six different phonotactic contexts: i) ##_V, ii) V#_V, iii) V_V, iv) V_C[+voice], v) V_C[-voice], vi) V_##. In the first context, the examined segment occurred utterance-initially, whereas in the second case the word-initial consonant was preceded by a word-final vowel. Within the word, the segment also occurred intervocalically and before a voiced or an unvoiced consonant; the last context contained the consonant in a word-final and utterance-final (prepausal) position. All in all, the sentences yielded 34 different segment types: six consonants multiplied per six phonotactic contexts, minus two contexts given that /z/ is not allowed in word-initially (see Schmid 2009: 260, 267-268 for a detailed description of the read words/sentences).

The twenty sentences were read aloud by ten students of a public high school in the town of Zurich; at the time of the recording, they were aged sixteen and seventeen and had experienced seven years of formal instruction in French. During the recording session, the students had to read the sentences two times; between the two readings, they were engaged in a short informal conversation regarding topics such as spare time and holidays. The recordings took place in the library of the high school building by means of a digital recorder Edirol R-1 and a Sennheiser ME66 supercardioid microphone; a sample rate of 44.1 kHz and a quantization of 16 bit were employed.

As regards the acoustic analysis of the 340 tokens (the 34 segment types mentioned above read by 10 subjects), waveforms and spectrograms were inspected manually using the software *Praat* (Boersma and Weenink 2010). For each token the duration of the periodic signal was measured by means of two indices, i.e. the presence of glottal pulses and of a fundamental frequency contour. Considering that voicing is not a matter of everything or nothing, the percentage of voicing time was calculated for the duration of each segment.

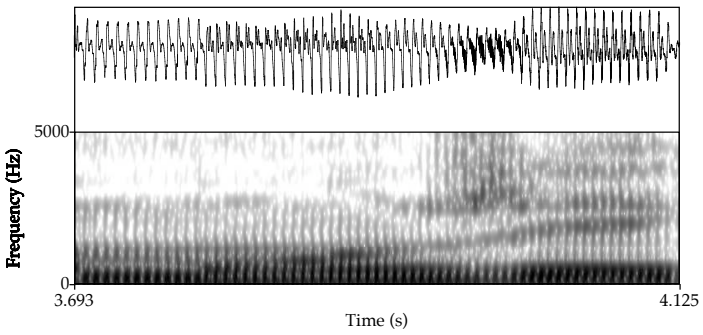
4. RESULTS

In the following sections, the recorded obstruents are analyzed from different point of views. First, a spectrographic illustration is provided of three types of fricatives – i.e. fully voiced, partially voiced, and fully devoiced. Second, the degrees of voicing are illustrated according to the phonotactic contexts in which the segments where uttered. Finally, differences in pronunciation accuracy among the 10 speakers are shown.

4.1. Voiced, partially voiced and fully devoiced fricatives

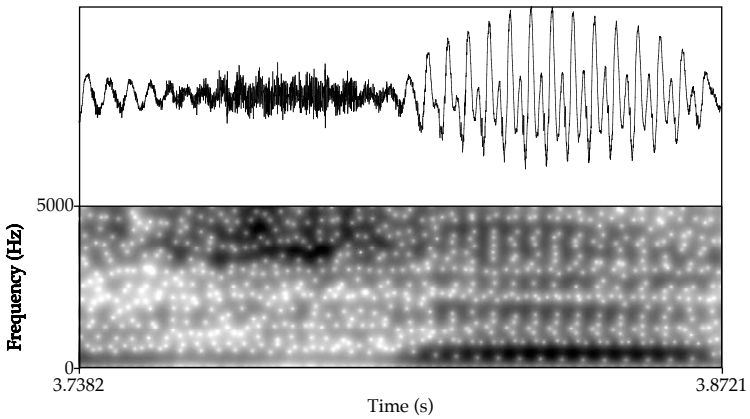
Fig. 1 shows the spectrogram of a fully voiced fricative in intervocalic position.

Figure 1: Wave form and spectrogram of the word *manger* "to eat" as pronounced by the speaker Dav.



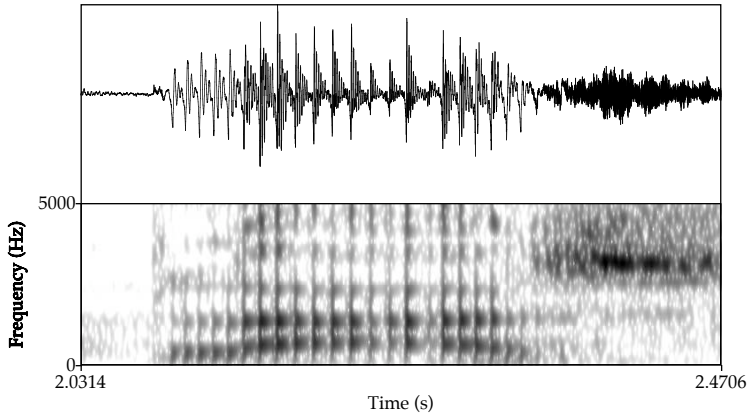
As is evident from the periodic oscillation in the wave form as well as from the continuous voice bar in the lower part in the spectrogram, the vocal folds are vibrating throughout the articulation of the fricative [ʒ]. However, in the word *je* "I" the same speaker pronounces a fricative [ʒ] which looses the initial periodicity during its articulation, as is shown in fig. 2.

Figure 2: Wave form and spectrogram of the word *je* "I" as pronounced by the speaker Lis.



Note that, word-finally, the first subject (Dav) also produces a fricative [ʒ] which is fully devoiced, as becomes clear from fig. 3

Figure 3: Wave form and spectrogram of the word *plage* "beach" as pronounced by the speaker Dav.



At this point, the question arises to which extent degrees of voicing are determined by phonotactic contexts and/or by individual differences among speakers.

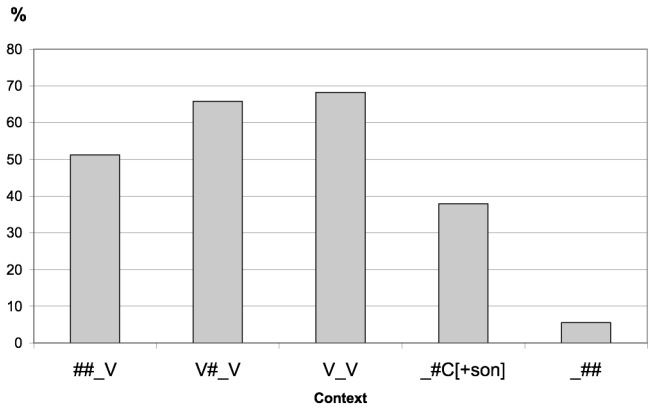
4.2. Degree of voicing according to the phonotactic context

Fig. 4 illustrates the degree of voicing in five phonotactic contexts (the sixth context, V_C[-voice], is not considered here, as in standard French devoicing does apply as well).

The histogram shows that the amount of voicing of the investigated obstruents is indeed affected by their position in the sound chain. In particular, it appears that in word-internal intervocalic position speakers attain an accuracy of 68%. Note that the presence of a word boundary has no impact on the pronunciation of the obstruents, as the degree of voicing still amounts to 66%; this finding is far from surprising, as word boundaries do not play any substantial role in the phonology of neither French nor Swiss German. Utterance-initially, we find a degree of voicing of 51%, whereas the percentage decreases further to 38% before a

voiced consonant (_#C[+son]). Most striking is the almost complete devoicing in utterance-final, prepausal position: in the whole corpus, the voiced French obstruent phonemes are pronounced with a degree of accuracy of only 6%.

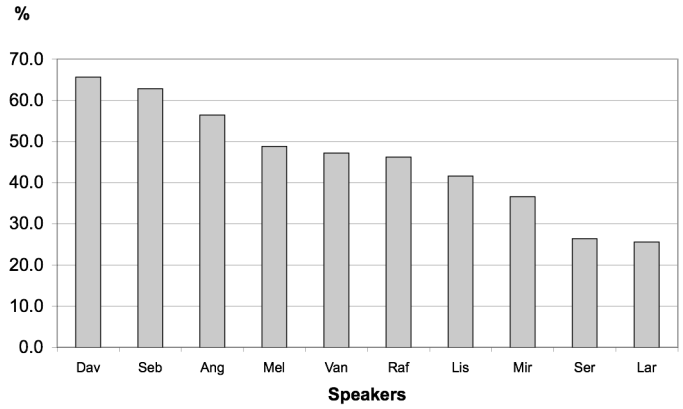
Figure 4: Degree of voicing of French L2 obstruents according to phonotactic contexts.



4.3. Degree of voicing according to speakers

Fig. 5 illustrates the individual differences observed among the subjects of our study, as far as degree of voicing is concerned.

Figure 5: Degree of voicing of French L2 obstruents according to speakers.



On the average, less than half of the whole amount of voicing time is realised by our speakers (46%). But obviously, some do better and some do worse. In fact, we find a considerable variation among the subjects, ranging from 24% and 25% (in the case of Ser and Lar) to 63% and 65% in the case of Seb and Dav; it is interesting to note that the subjects who performed most accurately are bilinguals, their mother tongue being Italian – a language that is characterized by highly voiced obstruents (cf. De Rosa and Schmid 2002; Schmid 2005).

5. DISCUSSION

There is no doubt that devoicing of voiced obstruents contributes to the 'foreign accent' in the French of Swiss German learners: given the pervasiveness of the feature [±tense] in their native dialects, they will tend to perceive and to produce voiced obstruents as 'lenes'. Not surprisingly, such a prediction is explicitely formulated in a grammar for Swiss teachers of French (Hilty and Wüest 1985: 28), and a previous experimental study has reported the devoicing of obstruents in the French of four subjects from Zurich

(Horner 1989: 48-49). It is important to note, however, that the substitution of L2 voiced obstruents with L1 'lenes' is not a purely paradigmatic process in the interlanguage phonology; distinguishing tokens by their phonotactic contexts (cf. fig. 4), one may detect two additional factors affecting the pronunciation of our subjects. The first syntagmatic process is still L1-based and derives from the postlexical fortition of two adjacent obstruents in Swiss German; here, our subjects behave quite differently from the Italian learners of French analyzed in the study of D'Apolito and Gili Fivela (2009), who were indeed able to pronounce sequences of two voiced obstruents. On the other hand, a second syntagmatic process that emerges from our data does not necessarily follow from the phonology of Swiss German, namely prepausal devoicing; note that this natural phonetic process has an even stronger impact on the performance of our subjects (cf. fig. 4).

Now, if interference from the L1 is not the only force that shapes the French interlanguage of Swiss German speakers, we must also stress the fact that not all voiced obstruents undergo devoicing; at least, this is the picture that emerges from our data. Even if the average accuracy of 46% is far from a native-like pronunciation, both intersubject variability (fig. 5) as well as variation due to the phonotactic contexts (fig. 4) demonstrate that our subjects have acquired the feature [±voice] to a certain extent. It may be unusual for a native speaker of Swiss German to pronounce a voiced obstruent in a second language, but it is not impossible.

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